

Test Results of the Peak Plantar Pressure of Various Insoles

We conducted a study to determine the plantar pressure under the medial forefoot and under the heel using:

1. Plain surgical shoe
2. Laminated insole with ¼” pink Plastazote and 1/8” PPT. This is the normal insole material for diabetic shoe.
3. Laminated insole with ¼” soft EVA for the bottom layer, ¼” pink Plastazote for the middle layer, and 1/8” Spenco for the top layer. One has no hole and another one has 3/16” holes drilled through all layers of the insole and are evenly spaced at ½”.

The plantar pressures were measured using the F-Scan in-shoe pressure measurement system (TekScan, South Boston, MA). The test was performed on a treadmill at a walking speed of 1.5mph with a female subject weights 135lbs and wearing a surgical shoe with and without the insoles above. Data were collected and tabulated as follow:

Plain Surgical Shoe	Pressure
Pressure Under Medial Forefoot	15 psi (10.35N/Cm2)
Pressure Under Heel	20 psi (13.8N/Cm2)

Insole with PPT and pink Plastazote and surgical shoe

Number 1 Insole	Without Holes
Pressure Under Medial Forefoot	14 psi (9.66N/Cm2)
Pressure Under Heel	18 psi (12.42N/Cm2)

Insole with ¼” soft EVA for the bottom layer, ¼” pink Plastazote for the middle layer, and 1/8” Spenco for the top layer, and surgical shoe

Number 2 insole	Without Holes	With Holes
Pressure Under Medial Forefoot	13 psi (8.98N/Cm2)	10 psi (6.9N/Cm2)
Pressure Under Heel	17 psi (11.73N/Cm2)	15 psi (10.35N/Cm2)

As indicated in the tables above, the peak plantar pressure was further reduced by using insoles with evenly spaced holes.

Similar study conducted by Lavery LA and cohorts in “Reducing Dynamic Foot Pressures in High-risk Diabetic Subjects With Foot Ulcerations” (Diabetes Care 19(8):818-821, 1996) reports mean peak pressure for ulcers under the 1st metatarsal heads (medial forefoot) for the Total Contact Cast, DH Pressure Relief Walker (Royce Medical, Camarillo, CA), Aircast Pneumatic Diabetic Walker (Aircast, Summit, NJ), Extra Depth Shoe as 7N/Cm², 8N/Cm², 12.3N/Cm², and 39.5N/Cm² respectively.

Another study conducted by Armstrong DG and cohorts in “Total Contact Casts and Removable Cast Walkers” (J Am Podiatric Medical Association 89(1):50-53, 1999) reports peak plantar heel pressure for the Total Contact Cast, DH Pressure Relief Walker, Aircast Pneumatic Diabetic Walker, and PW Minor Extra Depth Shoe (PW Minor and Son, Batavia, NY) as 18N/Cm², 19N/Cm², 20N/Cm², and 25N/Cm² respectively.

Comparing to the above studies for peak plantar pressure under the medial forefoot and the plantar heel, there is not a substantial difference between the new invention insole and the Total Contact Cast, which is a gold standard for offloading diabetic foot ulceration, to offload the medial forefoot (6.9N/Cm² vs 7N/Cm²). However, the new insole is much better to offload the plantar heel pressure (10.35N/Cm² vs 18N/Cm²).